REMARKS

The present Response is submitted in reply to the Official Action of January 25, 2007.

The Examiner objects to claim 17 because the separator recited in claim 17 is identified by the reference numeral 7 in that claim whereas the separator is identified by reference numeral 15 in the specification--reference number 7 is used in the specification to refer to a drill tube. In response, claim 17 is amended to replace the erroneous reference numeral "7" with the correct reference numeral "15". The Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw this objection to the specification.

The Examiner also objects to the drawings under 37 CFR 1.83(1) as not showing each element recited in the claims and, more specifically, as not showing the "water jet pump" recited in the claims. The drawings are amended, per the attached Submission, to overcome the noted informality, i.e., to show the "water jet pump" disclosed in, for example, paragraph 035 of the specification. The specification is correspondingly amended to now identify the "water jet pump" as element 20. It is respectfully submitted that no new matter is entered by the same. A new Replacement Sheet of formal drawings, accompany the attached Submission, incorporates all of the requested drawing amendment(s). If any further amendment to the drawings is believed necessary, the Examiner is invited to contact the undersigned representative of the Applicant to discuss the same.

Next, 21, 25, 26 and 27 are objected to for certain informalities therein while claims 15, 16, 22 and 25-27 are rejected, under 35 U.S.C. § 112, second paragraph, as being indefinite for the reasons noted in the official action. In response, the pending claims are suitably amended to correct the noted informalities and so that all of the presently pending claims now particularly point out and distinctly claim the subject matter regarded as the invention, thereby overcoming all of the raised objections and all of the raised 35 U.S.C. 112 § 112 rejections. The entered claim amendments are directed solely at overcoming the

identified informalities and the raised indefiniteness rejections, are not directed at distinguishing the present invention from the art of record in this case, and are fully supported by the specification as originally filed. The Applicant therefore respectfully requests that the Examiner reconsider and withdraw all objections and all rejections of the claims under 35 U.S.C. 112.

Claims 15-18, 20 and 22-27 are then rejected, under 35 U.S.C. § 103(a), over Watts et al. `805 in view of Lund `187. The Applicant acknowledges and respectfully traverses the raised obviousness rejection in view of the above amendments and the following remarks.

First considering the present invention as recited in claim 15 and as equivalently recited in claims 16-18, 20 and 22-27, the present invention is directed to a device and method for determining the air content, air separation behavior and surface area foam formation of oil, such as transmission oil. As recited in claim 15, and in claims 16-18, 20 and 22-27, the device includes a conveyor system for transporting the oil to be tested through the pipelines of the device, a compressed air port in one pipeline for injecting air into the oil being tested, an air-oil mixer for mixing the air into the oil, a Venturi pipe in one of the pipe lines, and a differential pressure sensor connected from separate drill tubes located at the start and end of the Venturi pipe to measure a differential pressure across the Venturi pipe.

As further recited in the claims, specifically in claims 25-27, the device operates with the air supply turned on for a first predetermined period to inject air into the oil and to mix the air into the oil, thereby forming a gas-in-liquid mixture, which will result in a pressure differential across the Venturi pipe that is measured by the differential pressure sensor at the end of the first predetermined time interval. The air is then turned off, which will result in a time dependent loss of air from the oil-air mixture that will be dependent upon, for example, the air content, the air separation behavior and the surface area foam formation characteristics of the oil. As described in the specification and recited in claims 25, 26 and 27, for example, the loss of air from the oil-air mixture will be represented over time by change in the differential pressure

across the Venturi pipe, and these differential pressures will be measured at least once and typically at several second predetermined time intervals after the air is turned off to determine the air content, the air separation behavior and the surface area foam formation characteristics of the oil.

Now considering the teachings of Watts et al. `805 in view of Lund `187, Watts et al. `805 relates to a device for determining the air entrapment characteristics of a liquid, specifically an oil. The device is a recirculating system wherein air is injected into oil drawn from a reservoir to form a gas-in-liquid dispersion of the type technically referred to as a "foam", see Watts et al. `805 at column 1, lines 10-28. The gas-in-liquid dispersion is then pressurized by a pump and passes through a high pressure section between the pump and a restricting valve, after which the gas-in-liquid dispersion is returned to the reservoir.

The gas-in-liquid dispersion is re-circulated until the gas-in-liquid dispersion reaches equilibrium, at which time a first sample is drained off into a graduated cylinder by opening a sampling valve for a specified time and the volume of the first sample is measured. The volume of the sample is then again measured after the air has been permitted to escape from the sample, and the difference between the first and the second sample volume measurements is taken as representing the volume of air in the gas-in-liquid dispersion.

It is, therefore, apparent that there are a number of fundamental distinctions between the present invention, as recited in claim 15, and thus in claims 16-18, 20 and 22-27, and the teachings of Watts et al. `805. For example, the Watts et al. `805 system determines the amount of air entrapped in a gas-in-liquid dispersion by injecting air into the oil, drawing a sample of the gas-in-liquid dispersion, that is, the oil aerated with air, and determining how much the volume of the sample decreases when the air is allowed to escape from the oil. Accordingly, the Watts et al. `805 system thereby takes a single measurement of a single factor of a single isolated sample of the gas-in-liquid dispersion.

The system and method of the present invention, as recited in claim 15 and thereby in claims 16-18, 20 and 22-27, employs a completely and fundamentally different method and apparatus for performing measurements on the gas-in-liquid dispersion. More specifically, the system and method of the present invention continuously measures the differential pressure across a Venturi pipeline as the gas-in-liquid dispersion flows continuously through the Venturi pipeline.

It is, therefore, apparent that the system and method taught by Watts et al. `805 has no relationship at all to the system and method of the present invention, as recited in the pending claims, and that the teachings of Watts et al. `805 therefore have no relationship at all to the present invention and are, in fact, directed to a completely and fundamentally different type of system than that of the present invention.

It must be further noted that the above fundamental differences between the system and method of the present invention and the system and method taught by Watts et al. `805 is further graphically illustrated by the very different results provided by the two systems. That is, and as described in Watts et al. `805, the Watts et al. `805 method and system provides only a measurement of volume of air entrapped in the oil. In contrast, the system and method of the present invention provides measurements of the air content, the air separation behavior and the surface area foam formation of the oil..

It is, therefore, apparent that the system of the present invention employs a completely different system and than does the Watts et al. `805 system. Specifically, the present invention makes continuous measurements of differential pressure measurements of the air content of the oil, the air separation behavior of the oil and the surface area foam formation characteristics of the oil. It must be further noted that the latter two factors cannot be measured by the Watts et al. `805 system.

It is, therefore, the Applicant's position that Watts et al. `805 does not and cannot teach or suggest the present invention, as recited in claim 15 and thereby in claims 16-18, 20 and 22-27, to those of ordinary skill in the relevant arts under the requirements and provisions of 35 U.S.C. § 103. It is therefore further the Applicant's position that the present invention, as recited in claim 15 and thereby in claims 16-18, 20 and 22-27, is fully and patentably distinguished over and from Watts et al. `805 under the requirements and provisions of 35 U.S.C. § 103. The Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw all rejections of claims 15 and 16-18, 20 and 22-27 over Watts et al. `805, under 35 U.S.C. § 103, and allow claims 15 and 16-18, 20 and 22-27.

Turning now to Lund `187, the Examiner holds that Lund `187 remedies the above noted deficiencies in the teachings of Watts et al. `805 by describing a Venturi differential measurement system that could be added to the Watts et al. `805 system to arrive at the system of the present invention. Considering Lund `187 in further detail, however, Lund `187 relates to a method and an apparatus for measuring a mass gas fraction of a "wet gas" which, as described and defined by Lund `187 at, for example, column 1, lines 12-14 and column 2, lines 29-34, is a multiphase mixture of gas and liquid wherein the gas comprises 90% or more of the volume of the mixture. Examples of such, as described by Lund `187, could include natural gas containing some amount of oil or water or both.

According to Lund `187, the "wet gas" passes through a measurement device comprising a flow conditioner 28 followed by a venturi member 8 and, as described at column 3, lines 6-14, three differential pressure measurements are taken across the measurement device. The first differential pressure measurement is taken across the flow conditioner, that is, between a point before the flow conditioner and a point after the flow conditioner and before the Venturi, the second being taken between the upstream end of the Venturi and the throat of the Venturi, and the third being taken across the venturi, that is, between the upstream and

downstream ends of the Venturi. The three measurements are then used to calculate the desired mass agas fraction according to a formula described in Lund `187.

It is, therefore, apparent that there are a number of fundamental distinctions between the present invention as recited in claims 15 and 16-18, 20 and 22-27 and the measurement device taught by Lund `187. For example, Lund `187 clearly and explicitly describes, for example at column 2, line 61-67 that the mixture being measured by the Lund `187 device is a "wet gas", which is explicitly described and defined by Lund `187 at, for example, column 1, lines 12-14, and column 2, lines 29-34, as a multiphase mixture of gas and liquid wherein the gas comprises 90% or more of the volume of the mixture. In addition, and as is clear from the Lund `187 description of the operation of flow conditioner 28, the liquid and gaseous components of the wet gas mixture are either largely separate from one another in the mixture or are easily separable from one another. That is, and as described by Lund `187, a major purpose of the flow conditioner is to mix the liquid and gas components so form a substantially uniform mixture so that the liquid and gas component are moving at substantially the same speed through the Venturi tube and so that there is no "slip" between the liquid and gas components. In complete and fundamental contrast from the Lund `187 device, however, the present invention, as recited in the claims, performs measurements on a gas-in-liquid dispersion comprising a gas entrapped in a liquid, so that the mixture is essentially a liquid containing a dissolved gas.

It is, therefore, apparent that the Lund `187 device and the system and method of the present invention perform measurements on entirely and fundamentally different types of oil/gas mixtures and that, for this reason, it is respectfully submitted that it would be essentially impossible to use the Lund `187 device to measure the type of oil/gas mixture measured by the system and method of the present invention.

This distinction is further emphasized by the fact that the system of the present invention performs a single differential pressure measurement across the Venturi pipeline, that is, between the upstream and downstream ends of the Venturi pipeline. In complete and fundamental contrast from the system and method of the present invention, however, the Lund `187 device is required to perform three differential pressure measurements, one across the flow conditioner, one between the upstream end and throat of the venturi, and one across the venturi, and to employ these three measurements in a complex equation.

It is, therefore, the Applicant's position that Lund `187 does not and cannot teach or suggest the present invention, as recited in claim 15 and thereby in claims 16-18, 20 and 22-27, to those of ordinary skill in the relevant arts under the requirements and provisions of 35 U.S.C. § 103. It is, therefore, further the Applicant's position that the present invention as recited in claim 15, and thereby in claims 16-18, 20 and 22-27, is fully and patentably distinguished over and from Lund `187 under the requirements and provisions of 35 U.S.C. § 103. The Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw all rejections of claims 15 and 16-18, 20 and 22-27 in view of Lund `187, under 35 U.S.C. § 103, and allow claims 15 and 16-18, 20 and 22-27.

Finally considering the combination of Watts et al. `805 in view of Lund `187, that is, the addition of the Lund `187 measurement device to the Watts et al. `805 system, it is first apparent that it would not occur to those of ordinary skill in the arts to combine the Lund `187 measurement device with the Watts et al. `805 system because, as discussed above in comparison of the Watts et al. `805 system and the present invention, the two systems teach entirely and fundamentally different methods and apparatus for measuring a liquid/gas mixture. That is, the Watts et al. `805 system takes a single measurement of a single factor of a single isolated sample of a gas-in-liquid dispersion while the Lund '187 device continuously measures differential pressures across a flow conditioner/venturi element as a liquid-in-gas mixture flows

continuously through the venturi. It is therefore apparent that the Watts et al. `805 system and the Lund '187 are so entirely and fundamentally different in their basic principles of operation that it would not occur to one of skill in the arts to arrive at the combination alleged by the Examiner.

It must also be noted in this regard that the teaching of the combination of a gas-in-liquid measurement system with a venturi/pressure differential measurement device is found only in the present invention, so that the combination suggested by the Examiner is, in fact, a combination taught by the present invention and not by either of the references.

It must further be noted that the combination of the Lund '187 measurement device into the Watts et al. `805 system would not only not result in any system having any relevance to the present invention, but would result in an inoperative system for the reasons discussed above. That is, and as discussed in detail herein above, Lund `187 clearly and explicitly describes that the mixture being measured by the Lund `187 device is a "wet gas" wherein the gas comprises 90% or more of the volume of the mixture and wherein the liquid and gaseous components of the wet gas mixture are either largely separate from one another in the mixture or are easily separable from one another.

In complete and fundamental contrast from the Lund `187 device, however, the Watts et al. `805 system is designed to perform measurements on a gas-in-liquid dispersion comprising a gas entrapped in a liquid, so that the mixture is essentially a liquid containing a dissolved gas.

It is, therefore, apparent that the Lund `187 device and the Watts et al. `805 system are designed to perform measurements on entirely and fundamentally different types of oil/gas mixtures and that, for this reason, it is respectfully submitted that it would be essentially impossible to use the Lund `187 device to measure the type of oil/gas mixture measured by the

Watts et al. `805 system, so that the addition of the Lund '187 measurement device to the Watts et al. `805 system would result in essentially an inoperative system.

It is therefore the Applicant's position that Watts et al. `805 in view of Lund `187 does not and cannot teach or suggest the present invention as recited in claim 15 and thereby in claims 16-18, 20 and 22-27 to those of ordinary skill in the relevant arts under the requirements and provisions of 35 U.S.C. § 103. It is therefore further the Applicant's position that the present invention as recited in claim 15 and thereby in claims 16-18, 20 and 22-27 is fully and patentably distinguished over and from Watts et al. `805 in view of Lund `187 under the requirements and provisions of 35 U.S.C. § 103.

The Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw all rejections of claims 15 and 16-18, 20 and 22-27 over Watts et al. `805 in view of Lund `187, under 35 U.S.C. § 103, and allow claims 15 and 16-18, 20 and 22-27 as presented herein above.

Lastly, the Applicant notes that the Examiner indicates that claims 19, 21 and 28 are objected to as being dependent from a rejected base claim but those claims would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claim(s), for which the Applicant respectfully thanks the Examiner. In view of this indication, claim 21 is amended to be an independent claims and the Applicant respectfully submits that amended claim 21 is now allowable.

If any further amendment to this application is believed necessary to advance prosecution and place this case in allowable form, the Examiner is courteously solicited to contact the undersigned representative of the Applicant to discuss the same.

In view of the above amendments and remarks, it is respectfully submitted that all of the raised rejection(s) should be withdrawn at this time. If the Examiner disagrees with the Applicant's view concerning the withdrawal of the outstanding rejection(s) or applicability of the

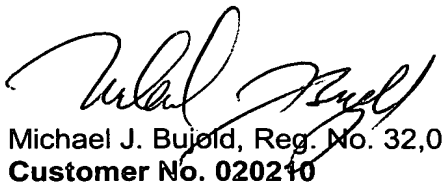
Watts et al. `805 and/or Lund `187 references, the Applicant respectfully requests the Examiner to indicate the specific passage or passages, or the drawing or drawings, which contain the necessary teaching, suggestion and/or disclosure required by case law. As such teaching, suggestion and/or disclosure is not present in the applied references, the raised rejection should be withdrawn at this time. Alternatively, if the Examiner is relying on his/her expertise in this field, the Applicant respectfully requests the Examiner to enter an affidavit substantiating the Examiner's position so that suitable contradictory evidence can be entered in this case by the Applicant.

In view of the foregoing, it is respectfully submitted that the raised rejection(s) should be withdrawn and this application is now placed in a condition for allowance. Action to that end, in the form of an early Notice of Allowance, is courteously solicited by the Applicant at this time.

The Applicant respectfully requests that any outstanding objection(s) or requirement(s), as to the form of this application, be held in abeyance until allowable subject matter is indicated for this case.

In the event that there are any fee deficiencies or additional fees are payable, please charge the same or credit any overpayment to our Deposit Account (Account No. 04-0213).

Respectfully submitted,



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Annotated Drawing

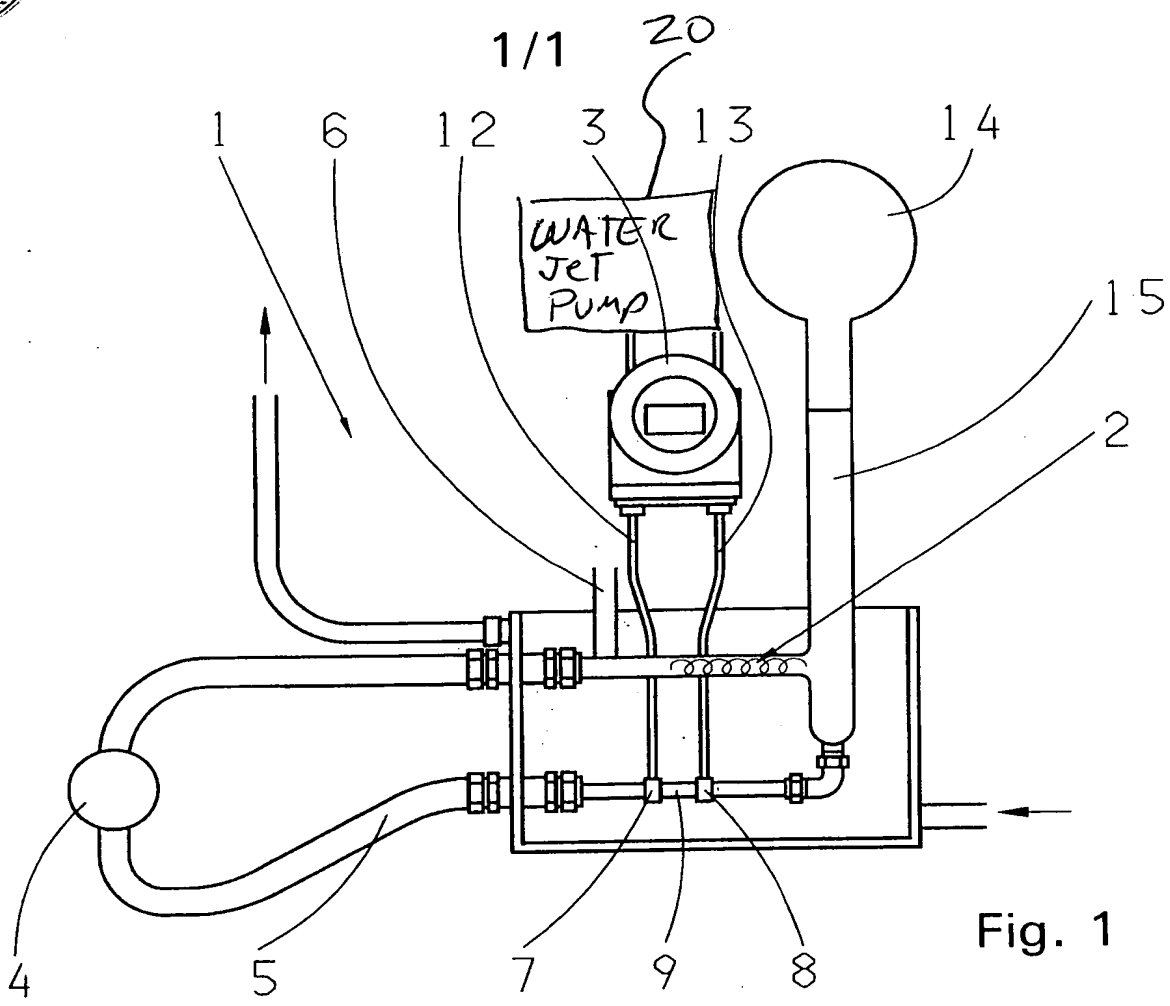

Fig. 1

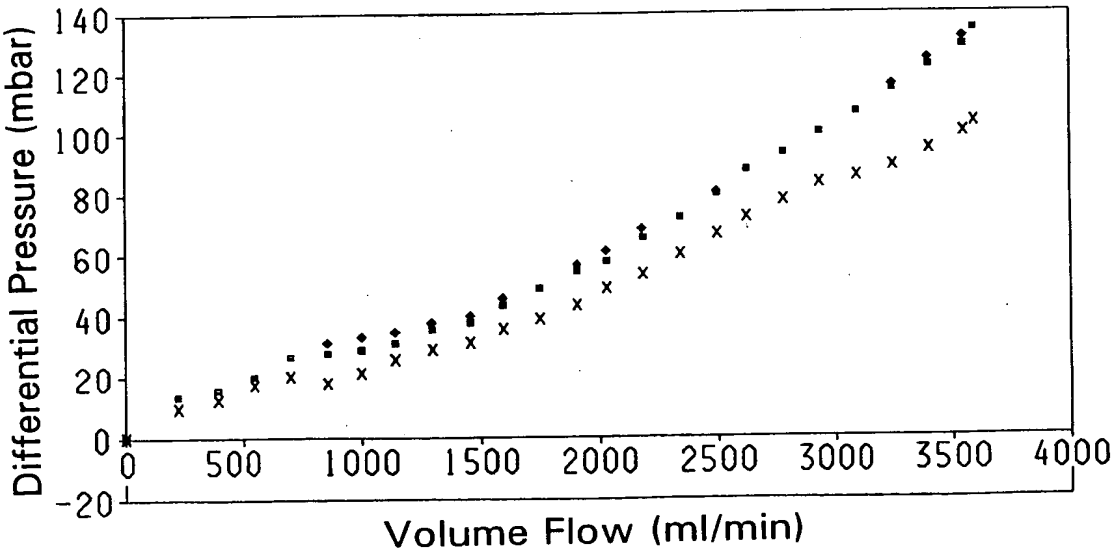

Fig. 2